produce a focusing effect on the accelerated ions. In this case, the segmented electrode pairs, such as **7a** and **7b** of FIG. 2, are employed also to define an abrupt potential drop.

The use of any of these embodiments and variations may be recommended depending on the anticipated parameters of the thruster regime, such as temperature, power, specific impulse, and propellant, as well as the anticipated mission requirements such as longevity, efficiency, and ease of satellite integration.

CLAIMS

What we claim as our invention is:

1. A Hall thruster with closed electron drift, with a substantially axial electric field applied across a coaxial channel, with substantially radial magnetic fields applied across said channel, such that ions are accelerated and can flow axially across said magnetic field, but such that electrons drift substantially in the azimuthal direction, comprising of:

an annular channel, with inner and outer walls made of an insulator material; and

a distributor of propellant gas, such that said gas is ionized in channel and then said ions are accelerated by said electric field; and

an anode, near the point of entry of the propellant gas into the channel; and

a cathode-neutralizer, located outside said channel, that both neutralizes said ion flow and establishes total accelerating voltage of said ions; and

a magnetic circuit that produces said substantially radial magnetic field; and

electrode segments of conducting material, placed along said channel, separated electrically by spacers of dielectric material; and

an electric circuit holding said electrode segments at specific potentials, so as to control the axial potential within the thruster channel.

2. An apparatus according to Claim 1 such that the segmented electrodes along said coaxial channel comprise rings of conducting material on the outer channel radii only.

3. An apparatus according to Claim 1 such that the segmented electrodes along said coaxial channel comprise rings of conducting material on the inner channel radii only.

4. An apparatus according to Claim 1 such that said rings of conducting material are on the inner and outer channel radii, with said rings on inner and outer radii arranged in pairs, with each said pair intersecting substantially the same line of magnetic force.

5. An apparatus according to Claim 1 such that said rings of conducting material are made of emissive material.

6. An apparatus according to Claim 1 such that said rings of conducting material are made of substantially non-emissive material.

7. An apparatus according to Claim 1 such that said rings of conducting material are on the inner and outer channel radii, with said rings on inner and outer radii arranged in a staggered design, such that electrodes placed on either said inner channel wall or said outer channel wall

are followed by electrodes placed on the opposite wall, so as establish an axial potential with maximum physical distance between material electrode segments.

8. An apparatus according to Claim 7 such that one segmented electrode ring of conducting material is placed on the anode-side of the magnetic field maximum; and

one segmented electrode ring is placed between said anode-side segmented electrode and the thruster exit; and

such that said anode-side segmented electrode is biased negative with respect to the anode.

9. An apparatus according to Claim 7 such that said rings of conducting material are made of emissive material.

10. An apparatus according to Claim 1 such that one set of electrodes establishes a localized potential drop in the acceleration region; and

such that one segmented electrode ring of conducting emissive material is placed on the anode-side of the magnetic field maximum; and

such that said anode-side segmented electrode is biased negative with respect to the anode; and

such that said anode-side emissive electrode emits electrons sufficient for ionization of the propellant gas.

11. An apparatus according to Claim 1 such that said rings of conducting material are made of emissive material, and

such that one set of electrodes establishes a localized potential drop in the acceleration region; and

such that one segmented electrode ring of conducting emissive material is placed on the cathode-side of the magnetic field maximum; and

such that said cathode-side emissive electrode emits electrons sufficient for neutralization of the ion stream.

12. An apparatus according to Claim 1 such that said segmented electrode annular rings of conducting material are positioned in the region along said thruster channel so as to establish a large axial potential drop where the applied radial magnetic field is substantially in the radial direction across the full channel, so as to optimally limit the ion plume divergence.

13. An apparatus according to Claim 1 such that said segmented electrode annular rings of conducting material are positioned in the region along said thruster channel so as to establish a large axial potential drop where the applied radial magnetic field is substantially in the radial direction, but also concave outwards towards the thruster exit, so as to produce a focusing effect on the accelerated ions.

14. An apparatus according to Claim 1 such that said electrodes are annular rings of conducting material positioned in the region along said thruster channel so as to establish a large

axial potential drop where the applied radial magnetic field is substantially purely in the radial direction across the full channel; and

such that the segmented electrode ring closest to the anode juts out into said thruster channel, thereby to constrict the plasma flow within the channel, so as to provide greater ionization.

15. An apparatus according to Claim 5 such that said emissive electrodes are made of high-temperature low-sputtering low work-function material, such as LaB6, dispenser tungsten, or barium oxide.

16. An apparatus according to Claim 6 such that said non-emissive electrodes are made of low-sputtering material, such as graphite or graphite modifications such as carbon-carbon fibers, tungsten, or molybdenum.

17. An apparatus according to Claim 1 such that said electric circuit includes switching circuitry capable of providing variable operation.

18. An apparatus according to Claim 1 such that said propellant gas is xenon and such that said total accelerating voltage potential is approximately 300 volts.

19. A Hall thruster with closed electron drift, with a substantially axial electric field applied across a coaxial channel, with substantially radial magnetic fields applied across said channel, such that ions are accelerated and can flow axially across said magnetic field, but such that electrons drift substantially in the azimuthal direction, comprising of:

an annular channel, with inner and outer walls made of an insulator material; and

a distributor of propellant gas, such that said gas is ionized in channel and then said ions are accelerated by said electric field; and

an anode, near the point of entry of the propellant gas into the channel; and

a magnetic circuit that produces said substantially radial magnetic field; and

a pair of electrode segments of emissive conducting material, placed along said channel; and

such that said rings of electrodes establish a localized potential drop in the acceleration region; and

such that said cathode-side emissive electrode emits electrons sufficient for neutralization of the accelerated ions, thereby eliminating the need for a separate cathode-neutralizer; and

an electric circuit holding said electrode segments at specific potentials, so as to control the axial potential within the thruster channel.

20. An apparatus according to Claim 19,

such that a potential drop is established between the anode-side emissive electrode and the anode; and

such that said anode-side emissive electrode emits electrons sufficient for ionization of the propellant gas.